

REMARKS/ARGUMENTS

The Examiner rejected claims 1 – 11 as unpatentable under 35 U.S.C. § 103(a) over U.S. patent No. 4,419,154 (Davitt et al.) in view of U.S. patent No. 3,291,664 (Taylor et al.).

*Rejection under 35 U. S. C. §103(a) as unpatentable over
Davitt et al. in view of Taylor et al.*

The broadest of the rejected claims are directed to a delay composition comprising mixed particles of silicon, barium sulfate and red lead, wherein the red lead is about 3 to 15 wt.% of the composition, although the claims are being examined with respect to an elected species also including a binder (carboxymethyl cellulose) which is within the scope of all the appealed claims. All the claims have been finally rejected under 35 U.S.C. § 103(a) as unpatentable over Davitt et al. in view of Taylor et al. The Examiner asserts that Davitt et al. discloses a delay element that comprises barium sulfate, silicon and red lead; that Taylor et al. discloses the use of carboxymethyl cellulose with a delay composition; and that it would have been obvious to use the binder of Taylor et al. with the delay composition of Davitt et al.

Neither reference describes, and no combination of them would have made obvious, a content of about 3 to 15% by weight of red lead in a delay composition comprising mixed particles of silicon, barium sulfate and red lead, as recited in each of the independent claims (1 and 11).

In the final Office Action (pp. 2-3), the Examiner asserts that:

“Davitt et al discloses a delay composition comprising 15-60 % barium sulfate, 25-75 % red lead and 5-40 % of silicon. Davitt further states that the inclusion of red lead speeds up the burning time of the composition.

“Taylor et al teaches the use of up to 5 % sodium carboxymethyl cellulose with a delay composition.

“It would have been obvious ... to use less red lead to result in a lower burning rate. Since Davitt teaches that the inclusion of red lead would speed up the burning rate, it would conversely decrease if less red lead were used. It would have been obvious to use the binder as taught by Taylor with the delay

composition of Davitt since Taylor suggests that the binder is useful in delay compositions. ... It would also be obvious to vary the amounts of the ingredients to optimize the performance of the delay composition. It is well-settled that optimizing a result effective variable is well within the expected ability of a person of ordinary skill in the subject art.”

The problem with this rejection is that, even assuming *arguendo* that the asserted combination of references would have been obvious (i.e., that it would have been obvious to use the Taylor et al. binder in the Davitt et al. composition), that combination would not meet or make obvious the claimed invention. In particular, it would not meet or make obvious the critical feature (to which all the claims are expressly limited) that the red lead content of the composition is about 3 to 15% by weight.

It is well settled that a novel range of proportions of one or more ingredients may constitute a patentable distinction over prior art showing the recited ingredients but not the claimed proportions. See *In re Peterson*, 65 U.S.P.Q. 2d 1379 (Fed. Cir. 2003).

Indeed, given that Davitt et al. does not mention any range or value of red lead content (in a delay composition mixture of barium sulfate, silicon and red lead) that embraces, overlaps or even approaches the range to which all the claims are expressly limited, it is submitted that the range of red lead disclosed in the patent cannot be said to render *prima facie* obvious Applicant’s claimed narrow range of about 3 to 15 wt.%. Cf. *In re Peterson*, *supra*.

The Examiner’s assertion that “Since Davitt teaches that the inclusion of red lead would speed up the burning rate, it would conversely decrease if less red lead were used” does not supply a motivation “to use less red lead” because red lead is described by Davitt et al. only as having “the effect of somewhat speeding up the burning time of the composition” (col. 6, lines 1-3). There is nothing in Davitt et al. to suggest that low levels of red lead would reduce burning rate.

The Examiner may be contending that, from the teaching of Davitt et al., if one skilled in the art wants to accelerate the burning rate (as compared to a red-lead-free composition) but only to a slight extent, he or she might use a lesser amount of red lead than is prescribed by Davitt et al., indeed coming within the range of the present claims; and the fact that this use of a low red lead level inherently also achieves the applicants’ unforeseen advantage would not overcome obviousness.

This argument, however, suffers from a number of weaknesses. First, nothing in the applied references would motivate the artisan of ordinary skill to seek a reduced degree of

enhancement of burning rate. Second, the lack of any burn-rate-accelerating effect of red lead over most of Applicant's claimed range (as demonstrated by data in Applicant's specification, discussed in the "Summary of Claimed Subject Matter" above) clearly demonstrates the narrowness of the limits of predictability in the present instance. Third, at such low levels, red lead is beneficial only in solving a problem nowhere mentioned in Davitt et al., and this is indeed the sort of unexpected result that should be given patentable weight.

As to the Examiner's assertion that "It would also be obvious to vary the amounts of the ingredients to optimize the performance of the delay composition," Davitt et al. does not disclose or intimate that the proportion of red lead, at least outside the described 25-75% range, is a result effective variable at all. A "routine optimization" obviousness rejection must be grounded in a showing that the "result effectiveness" of the variable being optimized is recognized in the art. *In re Antonie*, 195 U.S.P.Q. 6,9 (C.C.P.A. 1977). Davitt et al. suggests no reason for including levels of red lead below 25 wt.%; thus, within the scope of its teaching, any optimization of red lead content would occur only between 25 and 75 wt.%. What this means is that it would not have been routine or obvious to use a level of red lead content entirely outside and below this range, i.e., Applicant's claimed level of 3 - 15 wt.%.

Moreover, Applicant's use of red lead in a range of 3 to 15 wt.% (in a mixture with silicon and barium sulfate) achieves important and unexpected beneficial new results affording particular advantages for use with rigid metal confinement elements, an environment of use which (with its special problems) is entirely outside the contemplation of the Davitt et al. patent, which describes only a lead (non-rigid) metal confinement element (see Davitt et al., e.g. at col. 2, lines 22-24 and 65; col. 6, lines 38-40).

In a previous Office Action, the Examiner noted that the present claims are not limited to a rigid metal confinement element. Nevertheless, it is pertinent to the patentability of the claimed delay composition that the properties achieved by the presence of about 3 to 15 wt.% of red lead afford special advantages for use with a rigid metal element. Since Davitt et al. has no concern for rigid metal elements or their associated problems, it would not have been obvious from Davitt et al. to adjust the level of red lead content in such a way as to optimize composition properties to overcome those problems, even if Davitt et al. broadly taught or suggested (which it does not) that red lead content below 25% is a result-effective variable for other purposes. Thus, the improvement achieved by Applicant in properties specific for use with rigid metal elements would not be expected from Davitt et al. An unexpected result may impart patentable weight even to a selection of values of a recognized result-effective variable. *In re Antonie, supra*, 195 U.S.P.Q. at 8.

These unexpected results are shown in Table 1 and Figs. 9 and 10 of the present application, and discussed in the section headed "Summary of Claimed Subject Matter" above. To recapitulate, Table 1 on page 12 of the present application shows that the timing delay increases when red lead is first introduced (3% compared to 0%), so it is not acting just as an accelerant to the combustion process as might be expected. Indeed, Table 1 shows that at contents up to 9%, red lead increases the average time of delay compared to a composition having zero percent red lead. Again, red lead is not acting as an accelerant. On the other hand, a considerable improvement in reliability (Coefficient of Variation) is achieved compared to the composition having no red lead.

Figs. 9 and 10 of the application clearly show that, over the range of 3 to 15% for red lead, the delay timings and the Coefficient of Variation (CV) remain quite stable (reach a plateau), which are essential considerations for the present invention. If these values varied significantly within the range, it would make the compositions very sensitive to content variations, and it would be necessary to measure the proportions of the ingredients very precisely, possibly more precisely than is compatible with mass-production. Figs. 9 and 10 also show that the delay timing and CV are optimal for the invention.

At this point, Applicant would like to explain a slight inconsistency between values shown in Figs. 3 and 9 of the present application in the results provided for 3% and 5% additions of red lead. These differences are believed to be irrelevant for the reasons set out in the attached Declarations under 37 C.F.R. § 1.132 signed by Rejean Aube, one of the inventors of the present invention.

Of course, the rejection is based on a combination of references, but Taylor et al., cited only for the use of a binder (and containing no disclosure of a mixture of silicon, barium sulfate and red lead), is not even asserted to add anything to Davitt et al. with respect to the presence or range of red lead content. Thus, no combination of Taylor et al. with Davitt et al. could make obvious a composition as claimed containing about 3 to 15 wt.% red lead, whether or not a carboxymethyl cellulose binder is present.

As a further point, attention may be directed to U.S. patent No. 5,147,176 (Beck et al.). Though the Examiner has not relied on Beck et al., it is of record in the prosecution and is part of the "prior art" to which the nonobvious standard of § 103(a) is addressed, and with which the artisan of ordinary skill is presumed to be familiar. Beck et al. is the only reference of record that deals with problems caused by rigid metal elements for containing delay compositions; Beck et al. also incorporates by reference the British counterpart of Davitt et al. At col. 3, lines 45-52, Beck et al. describes the inclusion of red lead in a silicon-barium

sulfate delay composition for containment in a rigid metal element. There is no anticipation of the present invention because Beck et al. does not quantify the amount of red lead. Beck et al. states that red lead "would cause a faster rate of burning" but ascribes no other beneficial result and indicates that red lead may impair the effect of the flux which Beck et al. uses to solve the rigid metal element problems. There is certainly no disclosure or suggestion that red lead in any amount would overcome those specific problems; to the contrary, Beck et al. positively points away from the use of red lead at all. This being so, a person of ordinary skill in the art, having Beck et al. as well as Davitt et al. and Taylor et al. in mind, would not be led to try to optimize the properties of a silicon - barium sulfate - red lead delay composition, for containment in a rigid metal element, by varying the red lead content of the Davitt et al. mixture.

In summary, the references applied in the rejection do not disclose any range of red lead content that overlaps, embraces or even closely approaches the 3-15% range to which all the present claims are expressly limited. The sole purpose taught for including red lead in Davitt et al. is to accelerate the burning time of the composition (col. 6, lines 1-4), and the only red lead range mentioned in this connection is 25-75%, which is characterized as "typical." In contrast, Applicant is not interested in speeding up (or slowing down) the burning time but rather in assuring reliability of ignition in devices that have rigid confinement elements - a problem with which the Davitt et al. patent is not at all concerned. For this objective, Applicant uses a significantly lower proportion of red lead than anything mentioned by Davitt et al., and in this low range, "The presence of red lead ... does not substantially speed up or slow down the burning rate" (see Applicant's published application at paragraph [0039]), thereby negating the only utility disclosed by Davitt et al. for red lead.

In view of the above amendments and comments, favorable reconsideration and allowance of this application is requested.

Edwin Gale
Reg No. 28,584
Tel (613) 237-6900
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Respectfully submitted,

